

# Quality Assurance of Indoor Residual Spraying using Electromagnetic Wave Sensor Technology

Rinki M Deb<sup>1</sup>, Patryk Kot<sup>2</sup>, Magomed Muradov<sup>2</sup>, Samuel Rycroft<sup>2</sup>, Janet Hemingway<sup>1</sup>, Michael Coleman<sup>1</sup>

<sup>1</sup> Liverpool School of Tropical Medicine, Liverpool, UK & <sup>2</sup> Liverpool John Moores University, Liverpool, UK

## BACKGROUND:

The World Health Organization have set process, performance and impact indicators which should be monitored during each round of vector control. Quality assurance (QA) forms an essential component of performance monitoring and includes validation that the correct dose of insecticide is delivered onto sprayed surfaces.

There are two gold standard methods to support this:

1. To **quantify insecticide deposits** is **high performance liquid chromatography (HPLC)** on samples extracted from filter papers that were affixed to walls prior to indoor residual spraying (IRS).
2. **WHO Cone Bioassays** to **determine bio-efficacy**, aims to provide comprehensive information on the quality of IRS.

However, these methods require expensive equipment, HPLC grade reagents, skilled staff, are time consuming and require an extensive supply of live insects.

The use of electromagnetic waves, more specifically, microwaves and sensing technology have been used successfully for real-time applications such as fluid level measurement, material moisture content and monitoring biogas plants.

## AIM:

**Develop a hand-held QA sensor device capable of assessing indoor residual spray (IRS) performance in real-time.**

## RESULTS:

To support India's Visceral Leishmaniasis Elimination Programme, a highly sensitive **hand-held**, field-friendly **rapid result** device was designed for alpha-cypermethrin detection. Categorical **traffic-light based outputs** to inform the user whether residual insecticide detected is on-target, above or below the target dose. **Bluetooth functionality** enabled and **internal storage** for data retrieval.



Image of prototype designed for alpha-cypermethrin detection

## ONGOING WORK:

Alpha-cypermethrin: End user feedback under operational settings in India.

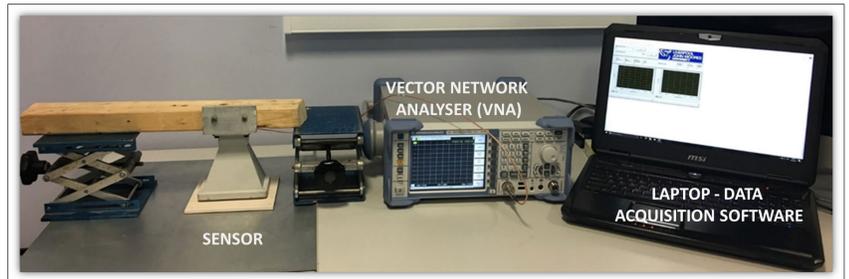
Other Insecticides: Funding has been secured to develop a hand-held sensor to assess spray quality within the African IRS market. Work ongoing with field work scheduled 2022 onwards.

## OPPORTUNITY:

To include other insecticides under development for IRS – please get in touch.

## METHOD:

**1. Proof of Principle:** Laboratory studies with known concentrations of insecticides on ceramic tiles



**2. Proof of Concept:** Field studies during IRS in Bihar, India



**3. Sensor Circuitry Miniaturisation**



**4. Prototype Validation**



**Datasets for Machine Learning**

